

Name: _____

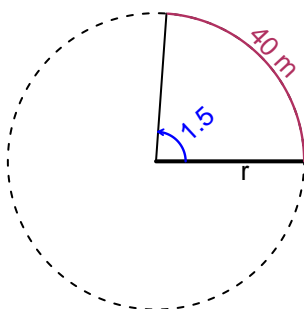
Date: _____

Trig Final (SLTN v657)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.5 radians. The arc length is 40 meters. How long is the radius in meters?

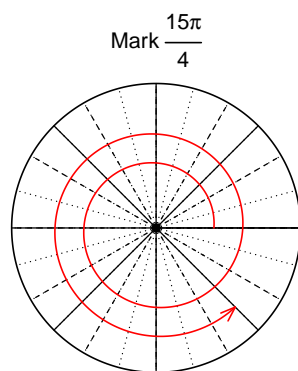


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 26.67$ meters.

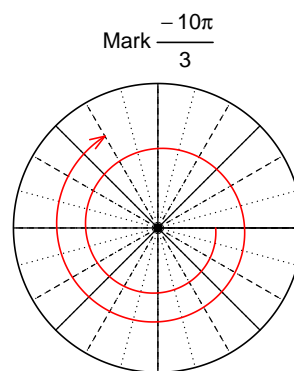
Question 2

Consider angles $\frac{15\pi}{4}$ and $-\frac{10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{15\pi}{4}\right)$ and $\sin\left(-\frac{10\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(15\pi/4)$

$$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$$



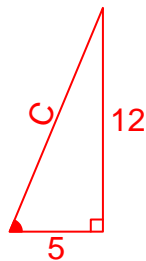
Find $\sin(-10\pi/3)$

$$\sin(-10\pi/3) = -\frac{\sqrt{3}}{2}$$

Question 3

If $\tan(\theta) = \frac{12}{5}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



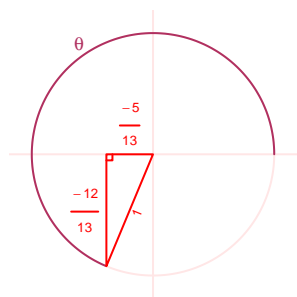
Solve the Pythagorean Equation

$$5^2 + 12^2 = C^2$$

$$C = \sqrt{5^2 + 12^2}$$

$$C = 13$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-5}{13}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.17 meters, a frequency of 3.73 Hz, and a midline at $y = 8.15$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.17 \sin(2\pi 3.73t) + 8.15$$

or

$$y = 5.17 \sin(7.46\pi t) + 8.15$$

or

$$y = 5.17 \sin(23.44t) + 8.15$$